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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/980,250	05/24/2002	Hans W.P. Koops	2345/170	9716

7590 03/02/2004

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EXAMINER	
QUASH, ANTHONY G	
ART UNIT	**PAPER NUMBER**
2881	

DATE MAILED: 03/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/980,250	HANS W. P. KOOPS ET AL	
	Examiner	Art Unit	
	Anthony Quash	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 24-46 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 24-46 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 1101.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 24-46 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 24-46 are rendered indefinite due to the fact that the applicant claims in independent claim 24; a "second anode" implying that there is a "first anode". However, nowhere in any of the claims is there mentioned anything about a first anode. Therefore, it is unclear from the claims whether or not there are two anodes, (and if so where is the location of the first anode with respect to the second anode), or just one anode. Appropriate correction is required.

The terms "terahertz radiation source" in claim 24 are a relative terms which render the claim indefinite. The terms "terahertz radiation source" are not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. In addition, it unclear what form this type of radiation is to take. Specifically, it is unclear if the applicants' are claiming that the terahertz radiation is in the form of electrons, ions, light, etc.... Appropriate correction is required.

The terms "suitable period" in claim 38 are a relative terms which render the claim indefinite. The terms "suitable period" are not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one

of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 24-25 are rejected to the extent understood under 35 U.S.C. 103(a) as being unpatentable over Fleisher [899] in view of Wortman [726] and further in view of Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures). As per claim 24, Fleisher [899] teaches a radiation source based upon the Smith-Purcell effect comprising a cathode circuit (4) for producing electrons and comprising focusing means, a beam deflector (9,10), a grating of metal (grating elements 1-5), and an anode (40,42). In addition, it teaches that the electrons from the source are focused and transmitted over a defined distance over a diffraction grating having traversely disposed gratings so that in response to an image charge oscillating within a profile of the diffraction grating an electromagnetic wave of a wavelength is emitted and is adjustable as a function of a periodicity of lines and of electron velocity. See Fleisher [899] abstract, figs. 1-5, column 1, col. 2 lines10-27, 40-45, 65-75, and column 3. However, Fleisher [899] does not explicitly

state that the electron source should be a field emitter. Wortman [726] does teach an electron source being a field emitter. See Wortman [726] abstract, fig. 1, col. 1 lines 15-35, col. 2 lines 13-25, 50-69. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the electron source be a field emitter since field emitters do not require a cathode heater source and can thereby allow "instant-on" devices which can be made lighter in weight for possible use in satellites as well as numerous other military and civilian applications as taught in Wortman [726]. Although neither Fleisher [899] nor Wortman [726] explicitly teach the field emitter, the electrostatic lens, the beam deflector, the grating of metal and the second electrode being integrated on a semiconductor chip using one of additive and nanolithographic methods, Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures) does teach the use of additive nanolithography with electron beam induced deposition being applied to generate a nanostructured integrated field emission electron source along with resistors and other nanostructures. See Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures) entire article. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the field emitter, the electrostatic lens, the beam deflector, the grating of metal and the second electrode be integrated on a semiconductor chip using one of additive and nanolithographic methods in order to

reduce the chromatic aberration and provide a reliable integrated field emission source of high brightness as taught in Schoessler C et al.

As per claim 25, Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures) teaches the wire being constructed using additive nanolithography out of readily conductive material having stabilizing series resistance, and wherein the wire is positioned using in at least one of a straight design and a curved design to end freely over a surface of a conductor path structure for any electrical terminals and connections in any tips of the field emitter. See Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures) pages 864-865, and fig. 5. In addition, see Koops [DE-19609234] abstract, and figs. 4-6 for a better illustration of this.

Claims 24-46 are rejected to the extent understood under 35 U.S.C. 103(a) as being unpatentable over Chang [550] in view of Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures). As per claim 24, Chang [550] teaches a field emitter (32,105) a means for focusing the electron beam (36), a metallic grating (10), beam deflecting means (applying a small voltage to the grating; this serves the same purpose as the deflectors in applicants' invention), and a collector (50), (which serves the same purpose as the second anode in applicants' invention). See Chang [550] abstract, figs. 1,5b, col. 1 lines 5-30, col. 25-

45, col. 3 lines 20-30, col. 4 lines 30-68, col. 5 lines 1-15, col. 12 lines 35-45, and col. 14 lines 30-35. Although Chang [550] does not explicitly teach the field emitter, the electrostatic lens, the beam deflector, the grating of metal and the second electrode being integrated on a semiconductor chip using one of additive and nanolithographic methods, Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures) does teach the use of additive nanolithography with electron beam induced deposition being applied to generate a nanostructured integrated field emission electron source along with resistors and other nanostructures. See Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures) entire article. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the field emitter, the electrostatic lens, the beam deflector, the grating of metal and the second electrode be integrated on a semiconductor chip using one of additive and nanolithographic methods in order to reduce the chromatic aberration and provide a reliable integrated field emission source of high brightness as taught in Schoessler C et al.

As per claim 25, Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures) teaches the wire being constructed using additive nanolithography out of readily conductive material having

stabilizing series resistance, and wherein the wire is positioned using in at least one of a straight design and a curved design to end freely over a surface of a conductor path structure for any electrical terminals and connections in any tips of the field emitter. See Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures) pages 864-865, and fig. 5. In addition, see Koops [DE-19609234] abstract, and figs. 4-6 for a better illustration of this.

As per claim 26, Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures) teaches the electron source having a punctiform design and a material, having a low work function and emits electrons at lest in response to relatively low voltages, and is deposited on any tips of the field emitter using additive nanolithography. See Schoessler C et al., "Nanostructured Integrated Electron Source", Silicon Heterostructures: From Physics to Devices, Journal of Vacuum Science & Technology (Microelectronics and Nanometer Structures) pages 864-865, and fig. 5. In addition, see Koops [DE-19609234] abstract, and figs. 4-6 for a better illustration of this.

As per claim 27, Chang [550] teaches the field emitter, the focusing means (equivalent to the electrostatic lens claimed applicants), beam deflecting means, the grating of metal and the second anode being encapsulated in a vacuum tight manner by a covering chip. See Chang [550] fig. 1 col. 4 lines 30-64.

Claims 28-32 are rejected for being based upon a previously rejected base claim.

As per claim 33, Chang [550] teaches a controllable voltage source connected via at least one of an electrical terminal and connection to the electron source to stabilize radiation from the electron source and wherein the electron beam exiting any tips of the field emitter is collected on an electrode of the anode (50). See Chang [550] abstract, figs. 1,5b, col. 1 lines 5-30, col. 25-45, col. 3 lines 20-30, col. 4 lines 30-68, col. 5 lines 1-15, col. 12 lines 35-45, and col. 14 lines 30-35.

As per claim 34, Chang [550] teaches adjusting the wavelength and/or generate a desired frequency spectrum, a voltage being applied between an earth electrode of the electrostatic lens and an electrode acting as the second anode (50) to alter the electron velocity along a grating. See Chang [550] abstract, figs. 1,5b, col. 1 lines 5-30, col. 25-45, col. 3 lines 20-30, col. 4 lines 30-68, col. 5 lines 1-15, col. 12 lines 35-45, and col. 14 lines 30-35.

As per claim 35, Chang [550] teaches the radiation source being covered by a window, and configured to be evacuated in a vacuum system prior to a bonding operation to a pressure within a range of (10^-4) Torr, and further comprising at least one chamber constructed in the vacuum system using thermal bonding so as to be at least one of encapsulated and sealed without short-circuiting a voltage supply. See Chang [550] abstract, figs. 1,5b, col. 1 lines 5-30, col. 25-45, col. 3 lines 20-30, col. 4 lines 30-68, col. 5 lines 1-15, col. 12 lines 35-45, and col. 14 lines 30-35.

Claims 36-39,41,43-46 are rejected for being dependent upon a rejected base claim.

As per claim 40, Chang [550] teaches the radiation source being configured to generate radiation as modulated radiation for spectroscopic purposes, and wherein the modulated radiation is generatable by modulating an extraction voltage at any tips of the field emitter. See Chang [550] abstract, figs. 1,5b, col. 1 lines 5-30, col. 25-45, col. 3 lines 20-30, col. 4 lines 30-68, col. 5 lines 1-15, col. 12 lines 35-45, and col. 14 lines 30-35.

As per claim 42, Chang [550] teaches an electrical field being applied between the electrostatic lens for focusing and an end of the grating of metal, an additional electrode of the second anode being positioned at the end of the grating of metal, which through an applied voltage, either accelerates or decelerates flying electrons. See Chang [550] abstract, figs. 1,5b, col. 1 lines 5-30, col. 25-45, col. 3 lines 20-30, col. 4 lines 30-68, col. 5 lines 1-15, col. 12 lines 35-45, and col. 14 lines 30-35.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent Nos. 5,790,585 to Walsh, 4,286,230 to Morrison et al, and 4,956,574 to Kane. Walsh [585] is considered pertinent due to its discussion on a grating coupling free electron laser apparatus and method. Morrison [230] is considered pertinent due to its discussion on a near millimeter wave generator with dielectric cavity. Kane [574] is considered pertinent due to its discussion on a field emission device comprising a first and second anode.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Quash whose telephone number is (571)-272-2480. The examiner can normally be reached on M-F from 9 a.m. to 5 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee, can be reached on (571)-272-2477. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956 or to the official fax number (703)-872-9306.

A. Quash 1/9/04

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